

# Logiweb codex of problemtwo

## Up Help

$*$   $\Rightarrow$   $*$ , **problemtwo**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **L<sub>o</sub>**, **pred calc**, **pc1**, **pc2**, **pc3**, **pc4**, **pc5**, **pc6**, **pc7**, **pc8**, **pc9**, **pc10**, **pc11**, **pc12**, **pcomp**, **pcunsound**, **pcded**, **pcia**, **pcie**, **pcdeduction**, **trivia**, **trivia2**, **iatest**, **andintro**, **andelim1**, **andelim2**, **orintro1**, **orintro2**, **orelim**, **notintro**, **notnotintro**, **notnotelim**, **mt**, **pbk**, **repeat**, **lem**, **forallintro**, **forallelim**, **existsintro**, **existselim**, **bottomelim**, **lemnotintro**, **nontriv0**, **nontriv1**, **nontriv2**, **nontriv3**, **nontriv4**, **nontriv5**, **nontriv6**,  $* \equiv *$ ,  $* = *$ ,  $\neg *$ ,  $* \wedge *$ ,  $* \vee *$ ,  $\forall *. (* )$ ,  $\exists *. (* )$ ,  $* \in *$ ,

$* \Rightarrow *$

$[x \Rightarrow y \xrightarrow{\text{tex}} \text{"\#1. \Rightarrow \#2."}]$

## problemtwo

$[\text{problemtwo} \xrightarrow{\text{prio}}$

### Preassociative

$[\text{problemtwo}]$ ,  $[\text{base}]$ ,  $[\text{bracket } * \text{ end bracket}]$ ,  $[\text{big bracket } * \text{ end bracket}]$ ,  $[\$ * \$]$ ,  $[\mathbf{flush\ left } *]$ ,  $[x]$ ,  $[y]$ ,  $[z]$ ,  $[[* \otimes *]]$ ,  $[[* \overset{*}{\rightarrow} *]]$ ,  $[\text{pyk}]$ ,  $[\text{tex}]$ ,  $[\text{name}]$ ,  $[\text{prio}]$ ,  $[*]$ ,  $[\mathbf{T}]$ ,  $[\text{if}(*, *, *)]$ ,  $[[* \overset{*}{\rightarrow} *]]$ ,  $[\text{val}]$ ,  $[\text{claim}]$ ,  $[\perp]$ ,  $[\text{f}(*)]$ ,  $[(*)^I]$ ,  $[\mathbf{F}]$ ,  $[0]$ ,  $[1]$ ,  $[2]$ ,  $[3]$ ,  $[4]$ ,  $[5]$ ,  $[6]$ ,  $[7]$ ,  $[8]$ ,  $[9]$ ,  $[a]$ ,  $[b]$ ,  $[c]$ ,  $[d]$ ,  $[e]$ ,  $[f]$ ,  $[g]$ ,  $[h]$ ,  $[i]$ ,  $[j]$ ,  $[k]$ ,  $[l]$ ,  $[m]$ ,  $[n]$ ,  $[o]$ ,  $[p]$ ,  $[q]$ ,  $[r]$ ,  $[s]$ ,  $[t]$ ,  $[u]$ ,  $[v]$ ,  $[w]$ ,  $[(*)^M]$ ,  $[\text{If}(*, *, *)]$ ,  $[\text{array}\{*\} * \text{end array}]$ ,  $[l]$ ,  $[c]$ ,  $[r]$ ,  $[\text{empty}]$ ,  $[( * | * := * )]$ ,  $[\mathcal{M}(*)]$ ,  $[\tilde{\mathcal{U}}(*)]$ ,  $[\mathcal{U}(*)]$ ,  $[\mathcal{U}^M(*)]$ ,  $[\mathbf{apply}(*, *)]$ ,  $[\mathbf{apply}_1(*, *)]$ ,  $[\text{identifier}(*)]$ ,  $[\text{identifier}_1(*, *)]$ ,  $[\text{array-plus}(*, *)]$ ,  $[\text{array-remove}(*, *, *)]$ ,  $[\text{array-put}(*, *, *, *)]$ ,  $[\text{array-add}(*, *, *, *, *)]$ ,  $[\text{bit}(*, *)]$ ,  $[\text{bit}_1(*, *)]$ ,  $[\text{rack}]$ ,  $[\text{"vector"}]$ ,  $[\text{"bibliography"}]$ ,  $[\text{"dictionary"}]$ ,  $[\text{"body"}]$ ,  $[\text{"codex"}]$ ,  $[\text{"expansion"}]$ ,  $[\text{"code"}]$ ,  $[\text{"cache"}]$ ,  $[\text{"diagnose"}]$ ,  $[\text{"pyk"}]$ ,  $[\text{"tex"}]$ ,  $[\text{"texname"}]$ ,  $[\text{"value"}]$ ,  $[\text{"message"}]$ ,  $[\text{"macro"}]$ ,  $[\text{"definition"}]$ ,  $[\text{"unpack"}]$ ,  $[\text{"claim"}]$ ,  $[\text{"priority"}]$ ,  $[\text{"lambda"}]$ ,  $[\text{"apply"}]$ ,  $[\text{"true"}]$ ,  $[\text{"if"}]$ ,  $[\text{"quote"}]$ ,  $[\text{"proclaim"}]$ ,  $[\text{"define"}]$ ,  $[\text{"introduce"}]$ ,  $[\text{"hide"}]$ ,  $[\text{"pre"}]$ ,  $[\text{"post"}]$ ,  $[\mathcal{E}(*, *, *)]$ ,  $[\mathcal{E}_2(*, *, *, *, *)]$ ,  $[\mathcal{E}_3(*, *, *, *, *)]$ ,  $[\mathcal{E}_4(*, *, *, *, *)]$ ,  $[\mathbf{lookup}(*, *, *)]$ ,  $[\mathbf{abstract}(*, *, *, *)]$ ,  $[[*]]$ ,  $[\mathcal{M}(*, *, *)]$ ,  $[\mathcal{M}_2(*, *, *, *)]$ ,  $[\mathcal{M}^*(*, *, *)]$ ,  $[\text{macro}]$ ,  $[s_0]$ ,  $[\mathbf{zip}(*, *)]$ ,  $[\mathbf{assoc}_1(*, *, *)]$ ,  $[(*)^P]$ ,  $[\text{self}]$ ,  $[[* \dot{=} *]]$ ,  $[[* \dot{=} *]]$ ,  $[[* \dot{=} *]]$ ,  $[[* \overset{\text{pyk}}{=} *]]$ ,  $[[* \overset{\text{tex}}{=} *]]$ ,  $[[* \overset{\text{name}}{=} *]]$ ,  $[\mathbf{Priority\ table}[*]]$ ,  $[\tilde{\mathcal{M}}_1]$ ,  $[\tilde{\mathcal{M}}_2(*)]$ ,  $[\tilde{\mathcal{M}}_3(*)]$ ,  $[\tilde{\mathcal{M}}_4(*, *, *, *)]$ ,  $[\mathcal{M}(*, *, *)]$ ,  $[\mathcal{Q}(*, *, *)]$ ,  $[\tilde{\mathcal{Q}}_2(*, *, *)]$ ,  $[\tilde{\mathcal{Q}}_3(*, *, *, *)]$ ,  $[\tilde{\mathcal{Q}}^*(*, *, *, *)]$ ,  $[(*)]$ ,  $[(*)]$ ,  $[\text{display}(*)]$ ,  $[\text{statement}(*)]$ ,  $[[* ]^+]$ ,  $[[* ]^-]$ ,  $[\mathbf{aspect}(*, *)]$ ,

$\text{[aspect}(*, *, *)$ ,  $\text{[}\langle * \rangle$ ,  $\text{[tuple}_1(*)$ ,  $\text{[tuple}_2(*)$ ,  $\text{[let}_2(*, *)$ ,  $\text{[let}_1(*, *)$ ,  
 $\text{[}\ast \stackrel{\text{claim}}{=} \ast]$ ,  $\text{[checker}$ ,  $\text{[check}(*, *, *)$ ,  $\text{[check}_2(*, *, *)$ ,  $\text{[check}_3(*, *, *)$ ,  
 $\text{[check}^*(*)$ ,  $\text{[check}_2^*(*)$ ,  $\text{[}\ast \cdot$ ,  $\text{[}\ast -$ ,  $\text{[}\ast \circ$ ,  $\text{[msg}$ ,  $\text{[}\ast \stackrel{\text{msg}}{=} \ast]$ ,  $\text{[}\langle \text{stmt} \rangle$ ,  
 $\text{[stmt}$ ,  $\text{[}\ast \stackrel{\text{stmt}}{=} \ast]$ ,  $\text{[HeadNil}'$ ,  $\text{[HeadPair}'$ ,  $\text{[Transitivity}'$ ,  $\text{[}\perp$ ,  $\text{[Contra}'$ ,  $\text{[T}'_{\text{E}}]$ ,  
 $\text{[L}_1]$ ,  $\text{[}\ast]$ ,  $\text{[A]}$ ,  $\text{[B]}$ ,  $\text{[C]}$ ,  $\text{[D]}$ ,  $\text{[E]}$ ,  $\text{[F]}$ ,  $\text{[G]}$ ,  $\text{[H]}$ ,  $\text{[I]}$ ,  $\text{[J]}$ ,  $\text{[K]}$ ,  $\text{[L]}$ ,  $\text{[M]}$ ,  $\text{[N]}$ ,  $\text{[O]}$ ,  $\text{[P]}$ ,  $\text{[Q]}$ ,  
 $\text{[R]}$ ,  $\text{[S]}$ ,  $\text{[T]}$ ,  $\text{[U]}$ ,  $\text{[V]}$ ,  $\text{[W]}$ ,  $\text{[X]}$ ,  $\text{[Y]}$ ,  $\text{[Z]}$ ,  $\text{[}\ast \mid \ast := \ast$ ,  $\text{[}\langle \ast \mid \ast := \ast \rangle$ ,  $\text{[}\emptyset$ ,  $\text{[Remainder}]$ ,  
 $\text{[}\ast \vee$ ,  $\text{[intro}(*, *, *, *)$ ,  $\text{[intro}(*, *, *)$ ,  $\text{[error}(*, *)$ ,  $\text{[error}_2(*, *)$ ,  $\text{[proof}(*, *, *)$ ,  
 $\text{[proof}_2(*, *)$ ,  $\text{[S}(*, *)$ ,  $\text{[S}^1(*, *)$ ,  $\text{[S}^{\triangleright}(*, *)$ ,  $\text{[S}_1^{\triangleright}(*, *, *)$ ,  $\text{[S}^{\text{E}}(*, *)$ ,  $\text{[S}_1^{\text{E}}(*, *, *)$ ,  
 $\text{[S}^+(*, *)$ ,  $\text{[S}_1^+(*, *, *)$ ,  $\text{[S}^-(*, *)$ ,  $\text{[S}_1^-(*, *, *)$ ,  $\text{[S}^*(*)$ ,  $\text{[S}_1^*(*)$ ,  $\text{[S}_2^*(*)$ ,  $\text{[S}^{\text{@}}(*, *)$ ,  
 $\text{[S}_1^{\text{@}}(*, *, *)$ ,  $\text{[S}^+(*, *)$ ,  $\text{[S}_1^+(*, *, *)$ ,  $\text{[S}^{\text{H}}(*, *)$ ,  
 $\text{[S}_1^{\text{H}}(*, *, *)$ ,  $\text{[S}^{\text{i.e.}}(*, *)$ ,  $\text{[S}_1^{\text{i.e.}}(*, *, *, *)$ ,  $\text{[S}_2^{\text{i.e.}}(*, *, *, *)$ ,  $\text{[S}^{\vee}(*, *)$ ,  
 $\text{[S}_1^{\vee}(*, *, *, *)$ ,  $\text{[S}^i(*, *)$ ,  $\text{[S}_1^i(*, *, *)$ ,  $\text{[S}_2^i(*, *, *, *)$ ,  $\text{[T}(*)$ ,  $\text{[claims}(*, *, *)$ ,  
 $\text{[claims}_2(*, *, *)$ ,  $\text{[}\langle \text{proof} \rangle$ ,  $\text{[proof}$ ,  $\text{[Lemma}(*, *)$ ,  $\text{[Proof of}(*, *)$ ,  
 $\text{[}\ast \text{ lemma}(*, *)$ ,  $\text{[}\ast \text{ antilemma}(*, *)$ ,  $\text{[}\ast \text{ rule}(*, *)$ ,  $\text{[}\ast \text{ antirule}(*, *)$ ,  
 $\text{[verifier}$ ,  $\text{[V}_1(*)$ ,  $\text{[V}_2(*, *)$ ,  $\text{[V}_3(*, *, *, *)$ ,  $\text{[V}_4(*, *)$ ,  $\text{[V}_5(*, *, *, *)$ ,  $\text{[V}_6(*, *, *, *)$ ,  
 $\text{[V}_7(*, *, *, *)$ ,  $\text{[Cut}(*, *)$ ,  $\text{[Head}_{\oplus}(*)$ ,  $\text{[Tail}_{\oplus}(*)$ ,  $\text{[rule}_1(*, *)$ ,  $\text{[rule}(*, *)$ ,  
 $\text{[Rule tactic}$ ,  $\text{[Plus}(*, *)$ ,  $\text{[Theory}(*, *)$ ,  $\text{[theory}_2(*, *)$ ,  $\text{[theory}_3(*, *)$ ,  
 $\text{[theory}_4(*, *, *)$ ,  $\text{[HeadNil}''$ ,  $\text{[HeadPair}''$ ,  $\text{[Transitivity}''$ ,  $\text{[Contra}'']$ ,  $\text{[HeadNil}$ ,  
 $\text{[HeadPair}$ ,  $\text{[Transitivity}$ ,  $\text{[Contra}$ ,  $\text{[T}_{\text{E}}$ ,  $\text{[ragged right}$ ,  
 $\text{[ragged right expansion]}$ ,  $\text{[parm}(*, *, *)$ ,  $\text{[parm}^*(*)$ ,  $\text{[inst}(*, *)$ ,  
 $\text{[inst}^*(*)$ ,  $\text{[occur}(*, *, *)$ ,  $\text{[occur}^*(*)$ ,  $\text{[unify}(* = *, *)$ ,  $\text{[unify}^*(*)$ ,  
 $\text{[unify}_2(* = *, *)$ ,  $\text{[L}_a]$ ,  $\text{[L}_b]$ ,  $\text{[L}_c]$ ,  $\text{[L}_d]$ ,  $\text{[L}_e]$ ,  $\text{[L}_f]$ ,  $\text{[L}_g]$ ,  $\text{[L}_h]$ ,  $\text{[L}_i]$ ,  $\text{[L}_j]$ ,  $\text{[L}_k]$ ,  $\text{[L}_l]$ ,  $\text{[L}_m]$ ,  
 $\text{[L}_n]$ ,  $\text{[L}_o]$ ,  $\text{[L}_p]$ ,  $\text{[L}_q]$ ,  $\text{[L}_r]$ ,  $\text{[L}_s]$ ,  $\text{[L}_t]$ ,  $\text{[L}_u]$ ,  $\text{[L}_v]$ ,  $\text{[L}_w]$ ,  $\text{[L}_x]$ ,  $\text{[L}_y]$ ,  $\text{[L}_z]$ ,  $\text{[L}_A]$ ,  $\text{[L}_B]$ ,  $\text{[L}_C]$ ,  
 $\text{[L}_D]$ ,  $\text{[L}_E]$ ,  $\text{[L}_F]$ ,  $\text{[L}_G]$ ,  $\text{[L}_H]$ ,  $\text{[L}_I]$ ,  $\text{[L}_J]$ ,  $\text{[L}_K]$ ,  $\text{[L}_L]$ ,  $\text{[L}_M]$ ,  $\text{[L}_N]$ ,  $\text{[L}_O]$ ,  $\text{[L}_P]$ ,  $\text{[L}_Q]$ ,  $\text{[L}_R]$ ,  
 $\text{[L}_S]$ ,  $\text{[L}_T]$ ,  $\text{[L}_U]$ ,  $\text{[L}_V]$ ,  $\text{[L}_W]$ ,  $\text{[L}_X]$ ,  $\text{[L}_Y]$ ,  $\text{[L}_Z]$ ,  $\text{[L}_?$ ,  $\text{[Reflexivity}$ ,  $\text{[Reflexivity}_1$ ,  
 $\text{[Commutativity}$ ,  $\text{[Commutativity}_1$ ,  $\text{[}\langle \text{tactic} \rangle$ ,  $\text{[tactic}$ ,  $\text{[}\ast \stackrel{\text{tactic}}{=} \ast]$ ,  $\text{[P}(*, *, *)$ ,  
 $\text{[P}^*(*)$ ,  $\text{[p}_0$ ,  $\text{[conclude}_1(*, *)$ ,  $\text{[conclude}_2(*, *, *)$ ,  $\text{[conclude}_3(*, *, *, *)$ ,  
 $\text{[conclude}_4(*, *)$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  
 $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[L}_o]$ ,  $\text{[check}$ ,  $\text{[}\ast \overset{\circ}{=} \ast]$ ,  $\text{[Root Visible}(*)$ ,  $\text{[A]}$ ,  $\text{[R]}$ ,  $\text{[C]}$ ,  $\text{[T]}$ ,  
 $\text{[L]}$ ,  $\text{[}\ast]$ ,  $\text{[}\bar{\ast}]$ ,  $\text{[a]}$ ,  $\text{[b]}$ ,  $\text{[c]}$ ,  $\text{[d]}$ ,  $\text{[e]}$ ,  $\text{[f]}$ ,  $\text{[g]}$ ,  $\text{[h]}$ ,  $\text{[i]}$ ,  $\text{[j]}$ ,  $\text{[k]}$ ,  $\text{[l]}$ ,  $\text{[m]}$ ,  $\text{[n]}$ ,  $\text{[o]}$ ,  $\text{[p]}$ ,  $\text{[q]}$ ,  $\text{[r]}$ ,  
 $\text{[s]}$ ,  $\text{[t]}$ ,  $\text{[u]}$ ,  $\text{[v]}$ ,  $\text{[w]}$ ,  $\text{[x]}$ ,  $\text{[y]}$ ,  $\text{[z]}$ ,  $\text{[}\ast \equiv \ast \mid \ast := \ast$ ,  $\text{[}\langle \ast \equiv \ast \mid \ast := \ast \rangle$ ,  $\text{[}\ast \equiv 1 \ast \mid \ast := \ast$ ,  
 $\text{[}\langle \ast \equiv \ast \mid \ast := \ast \rangle$ ,  $\text{[Ded}(*, *)$ ,  $\text{[Ded}_0(*, *)$ ,  $\text{[Ded}_1(*, *, *)$ ,  $\text{[Ded}_2(*, *, *)$ ,  
 $\text{[Ded}_3(*, *, *, *)$ ,  $\text{[Ded}_4(*, *, *, *)$ ,  $\text{[Ded}_4^*(*)$ ,  $\text{[Ded}_5(*, *, *)$ ,  
 $\text{[Ded}_6(*, *, *, *)$ ,  $\text{[Ded}_6^*(*)$ ,  $\text{[Ded}_7^*(*)$ ,  $\text{[Ded}_8^*(*)$ ,  $\text{[Ded}_8^*(*)$ ,  $\text{[S]}$ ,  $\text{[Neg]}$ ,  
 $\text{[MP]}$ ,  $\text{[Gen]}$ ,  $\text{[Ded]}$ ,  $\text{[S1]}$ ,  $\text{[S2]}$ ,  $\text{[S3]}$ ,  $\text{[S4]}$ ,  $\text{[S5]}$ ,  $\text{[S6]}$ ,  $\text{[S7]}$ ,  $\text{[S8]}$ ,  $\text{[S9]}$ ,  $\text{[Repetition]}$ ,  
 $\text{[A1}']$ ,  $\text{[A2}']$ ,  $\text{[A4}']$ ,  $\text{[A5}']$ ,  $\text{[Prop 3.2a]}$ ,  $\text{[Prop 3.2b]}$ ,  $\text{[Prop 3.2c]}$ ,  $\text{[Prop 3.2d]}$ ,  
 $\text{[Prop 3.2e}_1]$ ,  $\text{[Prop 3.2e}_2]$ ,  $\text{[Prop 3.2e]}$ ,  $\text{[Prop 3.2f}_1]$ ,  $\text{[Prop 3.2f}_2]$ ,  $\text{[Prop 3.2f]}$ ,  
 $\text{[Prop 3.2g}_1]$ ,  $\text{[Prop 3.2g}_2]$ ,  $\text{[Prop 3.2g]}$ ,  $\text{[Prop 3.2h}_1]$ ,  $\text{[Prop 3.2h}_2]$ ,  $\text{[Prop 3.2h]}$ ,  
 $\text{[Block}_1(*, *, *)$ ,  $\text{[Block}_2(*, *)$ ,  $\text{[pred calc}$ ,  $\text{[pc1]}$ ,  $\text{[pc2]}$ ,  $\text{[pc3]}$ ,  $\text{[pc4]}$ ,  $\text{[pc5]}$ ,  $\text{[pc6]}$ ,  
 $\text{[pc7]}$ ,  $\text{[pc8]}$ ,  $\text{[pc9]}$ ,  $\text{[pc10]}$ ,  $\text{[pc11]}$ ,  $\text{[pc12]}$ ,  $\text{[pcmp]}$ ,  $\text{[pcunsound]}$ ,  $\text{[pcded]}$ ,  $\text{[pcia]}$ ,  
 $\text{[pcie]}$ ,  $\text{[pcdeduction]}$ ,  $\text{[trivial]}$ ,  $\text{[trivial}_2]$ ,  $\text{[iatest]}$ ,  $\text{[andintro]}$ ,  $\text{[andelim}_1]$ ,  $\text{[andelim}_2]$ ,  
 $\text{[orintro}_1]$ ,  $\text{[orintro}_2]$ ,  $\text{[orelim]}$ ,  $\text{[notintro]}$ ,  $\text{[notnotintro]}$ ,  $\text{[notnotelim]}$ ,  $\text{[mt]}$ ,  $\text{[pbc]}$ ,  
 $\text{[repeat]}$ ,  $\text{[lem]}$ ,  $\text{[forallintro]}$ ,  $\text{[forallem]}$ ,  $\text{[existsintro]}$ ,  $\text{[existselim]}$ ,  $\text{[bottomelim]}$ ,  
 $\text{[lemnotintro]}$ ,  $\text{[nontriv}_0]$ ,  $\text{[nontriv}_1]$ ,  $\text{[nontriv}_2]$ ,  $\text{[nontriv}_3]$ ,  $\text{[nontriv}_4]$ ,  $\text{[nontriv}_5]$ ,  
 $\text{[nontriv}_6]$ ;

## Preassociative

[\*\_ {\*}], [\* /indexintro(\*, \*, \*, \*)], [\* /intro(\*, \*, \*)], [\* /bothintro(\*, \*, \*, \*, \*)],  
[\* /nameintro(\*, \*, \*, \*)], [\* '], [\* [\* ]], [\* [\* →]], [\* [\* ⇒]], [\* 0], [\* 1], [0b], [\* -color (\*)],  
[\* -color\* (\*)], [\* <sup>H</sup>], [\* <sup>T</sup>], [\* <sup>U</sup>], [\* <sup>h</sup>], [\* <sup>t</sup>], [\* <sup>s</sup>], [\* <sup>c</sup>], [\* <sup>d</sup>], [\* <sup>a</sup>], [\* <sup>C</sup>], [\* <sup>M</sup>], [\* <sup>B</sup>], [\* <sup>r</sup>], [\* <sup>i</sup>],  
[\* <sup>d</sup>], [\* <sup>R</sup>], [\* 0], [\* 1], [\* 2], [\* 3], [\* 4], [\* 5], [\* 6], [\* 7], [\* 8], [\* 9], [\* <sup>E</sup>], [\* <sup>V</sup>], [\* <sup>C</sup>], [\* <sup>C\*</sup>],  
[\* hide];

## Preassociative

[“ \* ”], [], [(\*)<sup>t</sup>], [string(\*) + \*], [string(\*) ++ \*], [  
\*, [ \*], [! \*], [“ \* ”], [# \*], [\$ \*], [% \*], [& \*], [’ \*], [(\*)], [()\*], [\*\*], [+ \*], [ \*], [- \*], [· \*], [/ \*],  
[0 \*], [1 \*], [2 \*], [3 \*], [4 \*], [5 \*], [6 \*], [7 \*], [8 \*], [9 \*], [: \*], [; \*], [< \*], [= \*], [> \*], [? \*],  
[@ \*], [A \*], [B \*], [C \*], [D \*], [E \*], [F \*], [G \*], [H \*], [I \*], [J \*], [K \*], [L \*], [M \*], [N \*],  
[O \*], [P \*], [Q \*], [R \*], [S \*], [T \*], [U \*], [V \*], [W \*], [X \*], [Y \*], [Z \*], [[ \*], [\ \*], [ ] \*], [^ \*],  
[\_ \*], [‘ \*], [a \*], [b \*], [c \*], [d \*], [e \*], [f \*], [g \*], [h \*], [i \*], [j \*], [k \*], [l \*], [m \*], [n \*], [o \*],  
[p \*], [q \*], [r \*], [s \*], [t \*], [u \*], [v \*], [w \*], [x \*], [y \*], [z \*], [{ \*}, [ | \*], [ } \*], [~ \*],  
[Preassociative \*; \*], [Postassociative \*; \*], [[ \*], \*], [priority \* end],  
[newline \*], [macro newline \*], [MacroIndent(\*)];

## Preassociative

[\* ’ \*], [\* ‘ \*];

## Preassociative

[\* /];

## Preassociative

[\* ’ \*], [\* ‘ \*];

## Preassociative

[\* · \*], [\* · 0 \*];

## Preassociative

[\* + \*], [\* + 0 \*], [\* + 1 \*], [\* - \*], [\* - 0 \*], [\* - 1 \*];

## Preassociative

[\* ∪ {\*}], [\* ∪ \*], [\* \{\*}];

## Postassociative

[\* .̇ \*], [\* .̇ \*], [\* :: \*], [\* + 2\* \*], [\* :: \*], [\* + 2\* \*];

## Postassociative

[\* , \*];

## Preassociative

[\* <sub>B</sub> ≈ \*], [\* <sub>D</sub> ≈ \*], [\* <sub>C</sub> ≈ \*], [\* <sub>P</sub> ≈ \*], [\* ≈ \*], [\* = \*], [\* → \*], [\* = \*], [\* = \*], [\* = \*], [\* = \*],  
[\* ∈<sub>T</sub> \*], [\* ⊆<sub>T</sub> \*], [\* <sub>T</sub> = \*], [\* <sub>S</sub> = \*], [\* free in \*], [\* free in\* \*], [\* free for \* in \*],  
[\* free for\* \* in \*], [\* ∈<sub>c</sub> \*], [\* < \*], [\* <’ \*], [\* ≤’ \*], [\* = \*], [\* ≠ \*], [\* <sup>var</sup>],  
[\* #<sup>0</sup> \*], [\* #<sup>1</sup> \*], [\* #\* \*], [\* ≡ \*], [\* = \*];

## Preassociative

[¬ \*], [¬ \*];

## Preassociative

[\* ∧ \*], [\*  $\ddot{\wedge}$  \*], [\*  $\tilde{\wedge}$  \*], [\* ∧<sub>c</sub> \*], [\* ∧ \*];

## Preassociative

[\* ∨ \*], [\* || \*], [\*  $\ddot{\vee}$  \*], [\* ∨ \*];

## Preassociative

[∃\* : \*], [∀\* : \*], [∀<sub>obj</sub>\* : \*], [∀\* . (\*)], [∃\* . (\*)];

**Postassociative**

$[* \dot{\Rightarrow} *], [* \Rightarrow *], [* \Leftrightarrow *];$

**Postassociative**

$[* : *], [* \text{ spy } *], [*! *];$

**Preassociative**

$[* \left\{ \begin{array}{c} * \\ * \end{array} \right.];$

**Preassociative**

$[\lambda * . *], [\Lambda * . *], [\Lambda *], [\text{if } * \text{ then } * \text{ else } *], [\text{let } * = * \text{ in } *], [\text{let } * \doteq * \text{ in } *];$

**Preassociative**

$[* \# *];$

**Preassociative**

$[*^!], [*^\triangleright], [*^\vee], [*^+], [*^-], [*^*];$

**Preassociative**

$[* @ *], [* \triangleright *], [* \blacktriangleright *], [* \gg *], [* \supseteq *];$

**Postassociative**

$[* \vdash *], [* \Vdash *], [* \text{ i.e. } *];$

**Preassociative**

$[\forall * : *], [\Pi * : *];$

**Postassociative**

$[* \oplus *];$

**Postassociative**

$[* ; *];$

**Preassociative**

$[* \text{ proves } *];$

**Preassociative**

$[* \text{ proof of } * : *], [\text{Line } * : * \gg *; *], [\text{Last line } * \gg * \square],$   
 $[\text{Line } * : \text{Premise } \gg *; *], [\text{Line } * : \text{Side-condition } \gg *; *], [\text{Arbitrary } \gg *; *],$   
 $[\text{Local } \gg * = *; *], [\text{Begin } *; * : \text{End}; *], [\text{Last block line } * \gg *; *],$   
 $[\text{Arbitrary } \gg *; *];$

**Postassociative**

$[* | *];$

**Postassociative**

$[* , *], [* [ * ] *];$

**Preassociative**

$[* \& *], [\rightarrow];$

**Preassociative**

$[* \\ *], [* \text{ linebreak}[4] *], [* \\ *];$

**Preassociative**

$[* \in *];]$

$[\text{problemtwo} \xrightarrow{\text{pyk}} \text{“problemtwo”}]$

$L_0$

```
[L0  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname L0 \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]  
[L0  $\xrightarrow{\text{pyk}}$  “ell aa”]
```

$L_0$

```
[L0  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname L0 \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]  
[L0  $\xrightarrow{\text{pyk}}$  “ell ab”]
```

$L_0$

```
[L0  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname L0 \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]  
[L0  $\xrightarrow{\text{pyk}}$  “ell ac”]
```

$L_0$

```
[L0  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname L0 \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]
```

[L<sub>o</sub>  $\xrightarrow{\text{pyk}}$  “ell ad”]

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname Lo \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]
```

[L<sub>o</sub>  $\xrightarrow{\text{pyk}}$  “ell ae”]

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname Lo \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]
```

[L<sub>o</sub>  $\xrightarrow{\text{pyk}}$  “ell af”]

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname Lo \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]
```

[L<sub>o</sub>  $\xrightarrow{\text{pyk}}$  “ell ag”]

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname Lo \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1
```

```
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwello \fi ”]
```

```
[Lo  $\xrightarrow{\text{pyk}}$  “ell ah”]
```

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “
\if \relax \csname lgwproofline\endcsname Lo \else
\if \relax \csname lgwello\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwello \fi ”]
```

```
[Lo  $\xrightarrow{\text{pyk}}$  “ell ai”]
```

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “
\if \relax \csname lgwproofline\endcsname Lo \else
\if \relax \csname lgwello\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwello \fi ”]
```

```
[Lo  $\xrightarrow{\text{pyk}}$  “ell aj”]
```

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “
\if \relax \csname lgwproofline\endcsname Lo \else
\if \relax \csname lgwello\endcsname
\global \advance \lgwproofline by 1
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }
\fi \lgwello \fi ”]
```

```
[Lo  $\xrightarrow{\text{pyk}}$  “ell ak”]
```

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname Lo \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]  
[Lo  $\xrightarrow{\text{pyk}}$  “ell al”]
```

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname Lo \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]  
[Lo  $\xrightarrow{\text{pyk}}$  “ell am”]
```

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname Lo \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]  
[Lo  $\xrightarrow{\text{pyk}}$  “ell an”]
```

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname Lo \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]
```



[L<sub>o</sub>  $\xrightarrow{\text{pyk}}$  “ell ao”]

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname Lo \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]
```

[L<sub>o</sub>  $\xrightarrow{\text{pyk}}$  “ell ap”]

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname Lo \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]
```

[L<sub>o</sub>  $\xrightarrow{\text{pyk}}$  “ell aq”]

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname Lo \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1  
\xdef \lgwello {L\ifnum \lgwproofline <10 0\fi \number \lgwproofline }  
\fi \lgwello \fi ”]
```

[L<sub>o</sub>  $\xrightarrow{\text{pyk}}$  “ell ar”]

L<sub>o</sub>

```
[Lo  $\xrightarrow{\text{tex}}$  “  
\if \relax \csname lgwprooflinep\endcsname Lo \else  
\if \relax \csname lgwello\endcsname  
\global \advance \lgwproofline by 1
```

$\backslash\text{def } \backslash\text{lgwello } \{L\backslash\text{ifnum } \backslash\text{lgwproofline} < 10\ 0\backslash\text{fi } \backslash\text{number } \backslash\text{lgwproofline } \}$   
 $\backslash\text{fi } \backslash\text{lgwello } \backslash\text{fi } \}$

$[L_o \xrightarrow{\text{pyk}} \text{“ell as”}]$

## pred calc

$[\text{pred calc} \xrightarrow{\text{stmt}} \forall \underline{x}. \forall \underline{r}. \forall \underline{g}. \forall \underline{f}. [\underline{x}] \#^0 [\underline{r}] \vdash [\underline{x}] \#^0 [\underline{g}] \vdash \langle [\underline{g}] \equiv^0 [\underline{f}] \mid [\underline{x}] := [\underline{r}] \rangle \vdash$   
 $\forall \underline{x}. (\underline{f}) \Rightarrow \underline{g} \oplus \forall \underline{f}. \forall \underline{g}. \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \wedge \underline{g} \oplus \forall \underline{f}. \forall \underline{g}. \underline{f} \wedge \underline{g} \Rightarrow \underline{g} \oplus \forall \underline{f}. \forall \underline{g}. \underline{f} \vdash \underline{g} \vdash \underline{f} \Rightarrow \underline{g} \oplus$   
 $\forall \underline{f}. \forall \underline{g}. \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \Rightarrow \neg \underline{g} \Rightarrow \neg \underline{f} \oplus \forall \underline{f}. \forall \underline{g}. \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \oplus \forall \underline{f}. \forall \underline{g}. \forall \underline{x}. [\underline{x}] \#^0 [\underline{g}] \vdash \underline{f} \Rightarrow$   
 $\underline{g} \vdash \exists \underline{x}. (\underline{f}) \Rightarrow \underline{g} \oplus \forall \underline{f}. \forall \underline{g}. \underline{f} \Rightarrow \underline{g} \vee \underline{f} \oplus \forall \underline{f}. \forall \underline{g}. \underline{f} \vdash \underline{f} \Rightarrow \underline{g} \vdash \underline{g} \oplus \forall \underline{f}. \neg \neg \underline{f} \Rightarrow \underline{f} \oplus$   
 $\forall \underline{f}. \forall \underline{g}. \forall \underline{h}. \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{f} \Rightarrow \underline{h} \oplus \forall \underline{a}. \forall \underline{b}. \lambda \underline{x}. \text{Ded}_0([\underline{a}], [\underline{b}]) \vdash \underline{a} \vdash \underline{b} \oplus$   
 $\forall \underline{f}. \forall \underline{g}. \underline{f} \wedge \underline{g} \Rightarrow \underline{f} \oplus \forall \underline{f}. \forall \underline{g}. \forall \underline{h}. \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{g} \Rightarrow \underline{f} \vee \underline{h} \Rightarrow \underline{g} \oplus$   
 $\forall \underline{f}. \forall \underline{g}. \forall \underline{x}. [\underline{x}] \#^0 [\underline{g}] \vdash \underline{g} \Rightarrow \underline{f} \vdash \underline{g} \Rightarrow \forall \underline{x}. (\underline{f}) \oplus \forall \underline{f}. \forall \underline{g}. \underline{f} \Rightarrow \underline{f} \vee \underline{g} \oplus$   
 $\forall \underline{x}. \forall \underline{r}. \forall \underline{g}. \forall \underline{f}. [\underline{x}] \#^0 [\underline{r}] \vdash [\underline{x}] \#^0 [\underline{g}] \vdash \langle [\underline{g}] \equiv^0 [\underline{f}] \mid [\underline{x}] := [\underline{r}] \rangle \vdash \underline{g} \Rightarrow \exists \underline{x}. (\underline{f})$

$[\text{pred calc} \xrightarrow{\text{pyk}} \text{“pred calc”}]$

## pc1

$[\text{pc1} \xrightarrow{\text{proof}} \text{Rule tactic}]$

$[\text{pc1} \xrightarrow{\text{stmt}} \text{pred calc} \vdash \forall \underline{f}. \forall \underline{g}. \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f}]$

$[\text{pc1} \xrightarrow{\text{pyk}} \text{“pc1”}]$

## pc2

$[\text{pc2} \xrightarrow{\text{proof}} \text{Rule tactic}]$

$[\text{pc2} \xrightarrow{\text{stmt}} \text{pred calc} \vdash \forall \underline{f}. \forall \underline{g}. \forall \underline{h}. \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{f} \Rightarrow \underline{h}]$

$[\text{pc2} \xrightarrow{\text{pyk}} \text{“pc2”}]$

## pc3

$[\text{pc3} \xrightarrow{\text{proof}} \text{Rule tactic}]$

$[\text{pc3} \xrightarrow{\text{stmt}} \text{pred calc} \vdash \forall \underline{f}. \forall \underline{g}. \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \wedge \underline{g}]$

$[\text{pc3} \xrightarrow{\text{pyk}} \text{“pc3”}]$

## pc4

[pc4  $\xrightarrow{\text{proof}}$  Rule tactic]

[pc4  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \Rightarrow \underline{f} \vee \underline{g}$ ]

[pc4  $\xrightarrow{\text{pyk}}$  “pc4”]

## pc5

[pc5  $\xrightarrow{\text{proof}}$  Rule tactic]

[pc5  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \Rightarrow \underline{g} \vee \underline{f}$ ]

[pc5  $\xrightarrow{\text{pyk}}$  “pc5”]

## pc6

[pc6  $\xrightarrow{\text{proof}}$  Rule tactic]

[pc6  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \wedge \underline{g} \Rightarrow \underline{f}$ ]

[pc6  $\xrightarrow{\text{pyk}}$  “pc6”]

## pc7

[pc7  $\xrightarrow{\text{proof}}$  Rule tactic]

[pc7  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \wedge \underline{g} \Rightarrow \underline{g}$ ]

[pc7  $\xrightarrow{\text{pyk}}$  “pc7”]

## pc8

[pc8  $\xrightarrow{\text{proof}}$  Rule tactic]

[pc8  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{f}: \forall \underline{g}: \forall \underline{h}: \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{g} \Rightarrow \underline{f} \vee \underline{h} \Rightarrow \underline{g}$ ]

[pc8  $\xrightarrow{\text{pyk}}$  “pc8”]

## pc9

[pc9  $\xrightarrow{\text{proof}}$  Rule tactic]

[pc9  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \Rightarrow \neg \underline{g} \Rightarrow \neg \underline{f}$ ]

[pc9  $\xrightarrow{\text{pyk}}$  “pc9”]

## pc10

[pc10  $\xrightarrow{\text{proof}}$  Rule tactic]

[pc10  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{f}: \neg \neg \underline{f} \Rightarrow \underline{f}$ ]

[pc10  $\xrightarrow{\text{pyk}}$  “pc10”]

## pc11

[pc11  $\xrightarrow{\text{proof}}$  Rule tactic]

[pc11  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{x}: \forall \underline{r}: \forall \underline{g}: \forall \underline{f}: [\underline{x}] \#^0 [\underline{r}] \Vdash [\underline{x}] \#^0 [\underline{g}] \Vdash \langle [\underline{g}] \equiv^0 [\underline{f}] \mid [\underline{x}] := [\underline{r}] \rangle \Vdash \forall \underline{x}. (\underline{f}) \Rightarrow \underline{g}$ ]

[pc11  $\xrightarrow{\text{pyk}}$  “pc11”]

## pc12

[pc12  $\xrightarrow{\text{proof}}$  Rule tactic]

[pc12  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{x}: \forall \underline{r}: \forall \underline{g}: \forall \underline{f}: [\underline{x}] \#^0 [\underline{r}] \Vdash [\underline{x}] \#^0 [\underline{g}] \Vdash \langle [\underline{g}] \equiv^0 [\underline{f}] \mid [\underline{x}] := [\underline{r}] \rangle \Vdash \underline{g} \Rightarrow \exists \underline{x}. (\underline{f})$ ]

[pc12  $\xrightarrow{\text{pyk}}$  “pc12”]

## pcmp

[pcmp  $\xrightarrow{\text{proof}}$  Rule tactic]

[pcmp  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \underline{f} \Rightarrow \underline{g} \vdash \underline{g}$ ]

[pcmp  $\xrightarrow{\text{pyk}}$  “pcmp”]





## andelim2

[andelim2  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}(\text{[pred calc } \vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \wedge \underline{g} \vdash \text{pc7} \gg \underline{f} \wedge \underline{g} \Rightarrow \underline{g}; \text{pcmp} \triangleright \underline{f} \wedge \underline{g} \triangleright \underline{f} \wedge \underline{g} \Rightarrow \underline{g} \gg \underline{g}]$ , p0, c)]

[andelim2  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \wedge \underline{g} \vdash \underline{g}$ ]

[andelim2  $\xrightarrow{\text{pyk}}$  “andelim2”]

## orintro1

[orintro1  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}(\text{[pred calc } \vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \text{pc4} \gg \underline{f} \Rightarrow \underline{f} \vee \underline{g}; \text{pcmp} \triangleright \underline{f} \triangleright \underline{f} \Rightarrow \underline{f} \vee \underline{g} \gg \underline{f} \vee \underline{g}]$ , p0, c)]

[orintro1  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \underline{f} \vee \underline{g}$ ]

[orintro1  $\xrightarrow{\text{pyk}}$  “orintro1”]

## orintro2

[orintro2  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}(\text{[pred calc } \vdash \forall \underline{f}: \forall \underline{g}: \underline{g} \vdash \text{pc5} \gg \underline{g} \Rightarrow \underline{f} \vee \underline{g}; \text{pcmp} \triangleright \underline{g} \triangleright \underline{g} \Rightarrow \underline{f} \vee \underline{g} \gg \underline{f} \vee \underline{g}]$ , p0, c)]

[orintro2  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{f}: \forall \underline{g}: \underline{g} \vdash \underline{f} \vee \underline{g}$ ]

[orintro2  $\xrightarrow{\text{pyk}}$  “orintro2”]

## orelim

[orelim  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}(\text{[pred calc } \vdash \forall \underline{f}: \forall \underline{g}: \forall \underline{h}: \underline{f} \vee \underline{g} \vdash \underline{f} \vdash \underline{h} \vdash \underline{g} \vdash \underline{h} \vdash \text{pcded} \triangleright \underline{f} \vdash \underline{h} \gg \underline{f} \Rightarrow \underline{h}; \text{pcded} \triangleright \underline{g} \vdash \underline{h} \gg \underline{g} \Rightarrow \underline{h}; \text{pc8} \gg \underline{f} \Rightarrow \underline{h} \Rightarrow \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{f} \vee \underline{g} \Rightarrow \underline{h}; \text{pcmp} \triangleright \underline{f} \Rightarrow \underline{h} \triangleright \underline{f} \Rightarrow \underline{h} \Rightarrow \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{f} \vee \underline{g} \Rightarrow \underline{h} \gg \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{f} \vee \underline{g} \Rightarrow \underline{h}; \text{pcmp} \triangleright \underline{g} \Rightarrow \underline{h} \triangleright \underline{g} \Rightarrow \underline{h} \Rightarrow \underline{f} \vee \underline{g} \Rightarrow \underline{h} \gg \underline{f} \vee \underline{g} \Rightarrow \underline{h}; \text{pcmp} \triangleright \underline{f} \vee \underline{g} \triangleright \underline{f} \vee \underline{g} \Rightarrow \underline{h} \gg \underline{h}]$ , p0, c)]

[orelim  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{f}: \forall \underline{g}: \forall \underline{h}: \underline{f} \vee \underline{g} \vdash \underline{f} \vdash \underline{h} \vdash \underline{g} \vdash \underline{h} \vdash \underline{h}$ ]

[orelim  $\xrightarrow{\text{pyk}}$  “orelim”]

## notintro

[notintro  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}(\text{[pred calc } \vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \underline{g} \vdash \underline{f} \vdash \neg \underline{g} \vdash \text{pcded} \triangleright \underline{f} \vdash \underline{g} \gg \underline{f} \Rightarrow \underline{g}; \text{pcded} \triangleright \underline{f} \vdash \neg \underline{g} \gg \underline{f} \Rightarrow \neg \underline{g}; \text{pc9} \gg \underline{f} \Rightarrow \underline{g} \Rightarrow \underline{f} \Rightarrow \neg \underline{g} \Rightarrow \neg \underline{f}; \text{pcmp} \triangleright \underline{f} \Rightarrow \underline{g} \triangleright \underline{f} \Rightarrow \underline{g}]$ , p0, c)]

$\underline{g} \Rightarrow \underline{f} \Rightarrow \neg \underline{g} \Rightarrow \neg \underline{f} \gg \underline{f} \Rightarrow \neg \underline{g} \Rightarrow \neg \underline{f}; \text{pcmp} \triangleright \underline{f} \Rightarrow \neg \underline{g} \triangleright \underline{f} \Rightarrow \neg \underline{g} \Rightarrow \neg \underline{f} \gg \neg \underline{f}], p_0, c)]$

$[\text{notintro} \xrightarrow{\text{stmt}} \text{pred calc} \vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \underline{g} \vdash \underline{f} \vdash \neg \underline{g} \vdash \neg \underline{f}]$

$[\text{notintro} \xrightarrow{\text{pyk}} \text{“notintro”}]$

## notnotintro

$[\text{notnotintro} \xrightarrow{\text{proof}} \lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{f}: \underline{f} \vdash \forall \underline{f}: \underline{f} \vdash \neg \underline{f} \vdash \text{repeat} \triangleright \underline{f} \gg \underline{f}; \text{pcdeduction} \triangleright \forall \underline{f}: \underline{f} \vdash \neg \underline{f} \vdash \underline{f} \gg \underline{f} \Rightarrow \neg \underline{f} \Rightarrow \underline{f}; \text{pcmp} \triangleright \underline{f} \triangleright \underline{f} \Rightarrow \neg \underline{f} \Rightarrow \underline{f} \gg \neg \underline{f} \Rightarrow \underline{f}; \text{trivia} \gg \neg \underline{f} \Rightarrow \neg \underline{f}; \text{pc9} \gg \neg \underline{f} \Rightarrow \underline{f} \Rightarrow \neg \underline{f} \Rightarrow \neg \underline{f} \Rightarrow \neg \neg \underline{f}; \text{pcmp} \triangleright \neg \underline{f} \Rightarrow \underline{f} \triangleright \neg \underline{f} \Rightarrow \underline{f} \Rightarrow \neg \underline{f} \Rightarrow \neg \underline{f} \Rightarrow \neg \neg \underline{f} \gg \neg \underline{f} \Rightarrow \neg \underline{f} \Rightarrow \neg \neg \underline{f}; \text{pcmp} \triangleright \neg \underline{f} \Rightarrow \neg \underline{f} \triangleright \neg \underline{f} \Rightarrow \neg \underline{f} \Rightarrow \neg \neg \underline{f} \gg \neg \neg \underline{f}], p_0, c)]$

$[\text{notnotintro} \xrightarrow{\text{stmt}} \text{pred calc} \vdash \forall \underline{f}: \underline{f} \vdash \neg \neg \underline{f}]$

$[\text{notnotintro} \xrightarrow{\text{pyk}} \text{“notnotintro”}]$

## notnotelim

$[\text{notnotelim} \xrightarrow{\text{proof}} \lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{f}: \neg \neg \underline{f} \vdash \text{pc10} \gg \neg \neg \underline{f} \Rightarrow \underline{f}; \text{pcmp} \triangleright \neg \neg \underline{f} \triangleright \neg \neg \underline{f} \Rightarrow \underline{f} \gg \underline{f}], p_0, c)]$

$[\text{notnotelim} \xrightarrow{\text{stmt}} \text{pred calc} \vdash \forall \underline{f}: \neg \neg \underline{f} \vdash \underline{f}]$

$[\text{notnotelim} \xrightarrow{\text{pyk}} \text{“notnotelim”}]$

## mt

$[\text{mt} \xrightarrow{\text{proof}} \lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \Rightarrow \underline{g} \vdash \neg \underline{g} \vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \text{pcmp} \triangleright \underline{f} \triangleright \underline{f} \Rightarrow \underline{g} \gg \underline{g}; \text{pcdeduction} \triangleright \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \underline{g} \gg \underline{f} \vdash \underline{g}; \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \text{repeat} \triangleright \neg \underline{g} \gg \neg \underline{g}; \text{pcdeduction} \triangleright \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \neg \underline{g} \gg \underline{f} \vdash \neg \underline{g}; \text{notintro} \triangleright \underline{f} \vdash \underline{g} \triangleright \underline{f} \vdash \neg \underline{g} \gg \neg \underline{f}], p_0, c)]$

$[\text{mt} \xrightarrow{\text{stmt}} \text{pred calc} \vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \Rightarrow \underline{g} \vdash \neg \underline{g} \vdash \neg \underline{f}]$

$[\text{mt} \xrightarrow{\text{pyk}} \text{“mt”}]$

## pbcc

$[\text{pbcc} \xrightarrow{\text{proof}} \lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{f}: \forall \underline{g}: \neg \underline{f} \vdash \underline{g} \vdash \neg \underline{f} \vdash \neg \underline{g} \vdash \text{notintro} \triangleright \neg \underline{f} \vdash \underline{g} \triangleright \neg \underline{f} \vdash \neg \underline{g} \gg \neg \neg \underline{f}; \text{notnotelim} \triangleright \neg \neg \underline{f} \gg \underline{f}], p_0, c)]$

$[\text{pbcc} \xrightarrow{\text{stmt}} \text{pred calc} \vdash \forall \underline{f}: \forall \underline{g}: \neg \underline{f} \vdash \underline{g} \vdash \neg \underline{f} \vdash \neg \underline{g} \vdash \underline{f}]$



[pbc  $\xrightarrow{\text{pyk}}$  “pbc”]

## repeat

[repeat  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{f}: \underline{f} \vdash \text{trivia} \gg \underline{f} \Rightarrow \underline{f}; \text{pcmp} \triangleright \underline{f} \triangleright \underline{f} \Rightarrow \underline{f} \gg \underline{f}], p_0, c)$ ]

[repeat  $\xrightarrow{\text{stmt}}$   $\text{pred calc} \vdash \forall \underline{f}: \underline{f} \vdash \underline{f}$ ]

[repeat  $\xrightarrow{\text{pyk}}$  “repeat”]

## lem

[lem  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{f}: \forall \underline{f}: \neg \underline{f} \vee \neg \underline{f} \vdash \forall \underline{f}: \underline{f} \vdash \text{orintro1} \triangleright \underline{f} \gg \underline{f} \vee \neg \underline{f}; \text{pcdeduction} \triangleright \forall \underline{f}: \underline{f} \vdash \underline{f} \vee \neg \underline{f} \gg \underline{f} \vdash \underline{f} \vee \neg \underline{f}; \forall \underline{f}: \underline{f} \vdash \text{repeat} \triangleright \neg \underline{f} \vee \neg \underline{f} \gg \neg \underline{f} \vee \neg \underline{f}; \text{pcdeduction} \triangleright \forall \underline{f}: \underline{f} \vdash \neg \underline{f} \vee \neg \underline{f} \gg \underline{f} \vdash \neg \underline{f} \vee \neg \underline{f}; \text{notintro} \triangleright \underline{f} \vdash \underline{f} \vee \neg \underline{f} \triangleright \underline{f} \vdash \neg \underline{f} \vee \neg \underline{f} \gg \neg \underline{f}; \text{orintro2} \triangleright \neg \underline{f} \gg \underline{f} \vee \neg \underline{f}; \text{pcdeduction} \triangleright \forall \underline{f}: \neg \underline{f} \vee \neg \underline{f} \vdash \underline{f} \vee \neg \underline{f} \gg \neg \underline{f} \vee \neg \underline{f} \vdash \underline{f} \vee \neg \underline{f}; \forall \underline{f}: \neg \underline{f} \vee \neg \underline{f} \vdash \text{repeat} \triangleright \neg \underline{f} \vee \neg \underline{f} \gg \neg \underline{f} \vee \neg \underline{f}; \text{pcdeduction} \triangleright \forall \underline{f}: \neg \underline{f} \vee \neg \underline{f} \vdash \neg \underline{f} \vee \neg \underline{f} \gg \neg \underline{f} \vee \neg \underline{f} \vdash \neg \underline{f} \vee \neg \underline{f} \vdash \neg \underline{f} \vee \neg \underline{f}; \text{notintro} \triangleright \neg \underline{f} \vee \neg \underline{f} \vdash \underline{f} \vee \neg \underline{f} \triangleright \neg \underline{f} \vee \neg \underline{f} \vdash \neg \underline{f} \vee \neg \underline{f} \vdash \neg \underline{f} \vee \neg \underline{f} \gg \neg \underline{f} \vee \neg \underline{f}; \text{notnotelim} \triangleright \neg \neg \underline{f} \vee \neg \underline{f} \gg \underline{f} \vee \neg \underline{f}], p_0, c)$ ]

[lem  $\xrightarrow{\text{stmt}}$   $\text{pred calc} \vdash \forall \underline{f}: \underline{f} \vee \neg \underline{f}$ ]

[lem  $\xrightarrow{\text{pyk}}$  “lem”]

## forallintro

[forallintro  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{f}: \forall \underline{g}: \forall \underline{x}: [\underline{x}] \#^0 [\underline{g} \vee \neg \underline{g}] \vdash \underline{f} \vdash \text{lem} \gg \underline{g} \vee \neg \underline{g}; \forall \underline{g}: \forall \underline{f}: \underline{g} \vee \neg \underline{g} \vdash \text{repeat} \triangleright \underline{f} \gg \underline{f}; \text{pcdeduction} \triangleright \forall \underline{g}: \forall \underline{f}: \underline{g} \vee \neg \underline{g} \vdash \underline{f} \gg \underline{g} \vee \neg \underline{g} \Rightarrow \underline{f}; \text{pcia} \triangleright [\underline{x}] \#^0 [\underline{g} \vee \neg \underline{g}] \triangleright \underline{g} \vee \neg \underline{g} \Rightarrow \underline{f} \gg \underline{g} \vee \neg \underline{g} \Rightarrow \forall \underline{x}. (\underline{f}); \text{pcmp} \triangleright \underline{g} \vee \neg \underline{g} \triangleright \underline{g} \vee \neg \underline{g} \Rightarrow \forall \underline{x}. (\underline{f}) \gg \forall \underline{x}. (\underline{f})], p_0, c)$ ]

[forallintro  $\xrightarrow{\text{stmt}}$   $\text{pred calc} \vdash \forall \underline{f}: \forall \underline{g}: \forall \underline{x}: [\underline{x}] \#^0 [\underline{g} \vee \neg \underline{g}] \vdash \underline{f} \vdash \forall \underline{x}. (\underline{f})$ ]

[forallintro  $\xrightarrow{\text{pyk}}$  “forallintro”]

## forallelim

[forallelim  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{x}: \forall \underline{r}: \forall \underline{g}: \forall \underline{f}: [\underline{x}] \#^0 [\underline{r}] \vdash [\underline{x}] \#^0 [\underline{g}] \vdash \langle [\underline{g}] \equiv^0 [\underline{f}] \mid [\underline{x}] := [\underline{r}] \rangle \vdash \text{pc11} \triangleright [\underline{x}] \#^0 [\underline{r}] \triangleright [\underline{x}] \#^0 [\underline{g}] \triangleright \langle [\underline{g}] \equiv^0 [\underline{f}] \mid [\underline{x}] := [\underline{r}] \rangle \gg \forall \underline{x}. (\underline{f}) \Rightarrow \underline{g}; \forall \underline{x}: \forall \underline{g}: \forall \underline{f}: \forall \underline{x}. (\underline{f}) \vdash \text{pcmp} \triangleright \forall \underline{x}. (\underline{f}) \triangleright \forall \underline{x}. (\underline{f}) \Rightarrow \underline{g} \gg \underline{g}; \text{pcdeduction} \triangleright \forall \underline{x}: \forall \underline{g}: \forall \underline{f}: \forall \underline{x}. (\underline{f}) \vdash \underline{g} \gg \forall \underline{x}. (\underline{f}) \vdash \underline{g}], p_0, c)$ ]

[forallelim  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{x}. \forall \underline{r}. \forall \underline{g}. \forall \underline{f}. [\underline{x}] \#^0 [\underline{r}] \vdash [\underline{x}] \#^0 [\underline{g}] \vdash \langle [\underline{g}] \equiv^0 [\underline{f}] \mid [\underline{x}] := [\underline{r}] \rangle \vdash \forall \underline{x}. (\underline{f}) \vdash \underline{g}$ ]

[forallelim  $\xrightarrow{\text{pyk}}$  “forallelim”]

## existsintro

[existsintro  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{x}. \forall \underline{r}. \forall \underline{g}. \forall \underline{f}. [\underline{x}] \#^0 [\underline{r}] \vdash [\underline{x}] \#^0 [\underline{g}] \vdash \langle [\underline{g}] \equiv^0 [\underline{f}] \mid [\underline{x}] := [\underline{r}] \rangle \vdash \text{pc12} \triangleright [\underline{x}] \#^0 [\underline{r}] \triangleright [\underline{x}] \#^0 [\underline{g}] \triangleright \langle [\underline{g}] \equiv^0 [\underline{f}] \mid [\underline{x}] := [\underline{r}] \rangle \gg \underline{g} \Rightarrow \exists \underline{x}. (\underline{f}) ; \forall \underline{x}. \forall \underline{g}. \forall \underline{f}. \underline{g} \vdash \text{pcmp} \triangleright \underline{g} \triangleright \underline{g} \Rightarrow \exists \underline{x}. (\underline{f}) \gg \exists \underline{x}. (\underline{f}) ; \text{pcdeduction} \triangleright \forall \underline{x}. \forall \underline{g}. \forall \underline{f}. \underline{g} \vdash \exists \underline{x}. (\underline{f}) \gg \underline{g} \vdash \exists \underline{x}. (\underline{f})], p_0, c)$ ]

[existsintro  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{x}. \forall \underline{r}. \forall \underline{g}. \forall \underline{f}. [\underline{x}] \#^0 [\underline{r}] \vdash [\underline{x}] \#^0 [\underline{g}] \vdash \langle [\underline{g}] \equiv^0 [\underline{f}] \mid [\underline{x}] := [\underline{r}] \rangle \vdash \underline{g} \vdash \exists \underline{x}. (\underline{f})$ ]

[existsintro  $\xrightarrow{\text{pyk}}$  “existsintro”]

## existselim

[existselim  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{x}. \forall \underline{f}. \forall \underline{g}. [\underline{x}] \#^0 [\underline{g}] \vdash \exists \underline{x}. (\underline{f}) \vdash \underline{f} \vdash \underline{g} \vdash \text{pcded} \triangleright \underline{f} \vdash \underline{g} \gg \underline{f} \Rightarrow \underline{g}; \text{pcie} \triangleright [\underline{x}] \#^0 [\underline{g}] \triangleright \underline{f} \Rightarrow \underline{g} \gg \exists \underline{x}. (\underline{f}) \Rightarrow \underline{g}; \text{pcmp} \triangleright \exists \underline{x}. (\underline{f}) \triangleright \exists \underline{x}. (\underline{f}) \Rightarrow \underline{g} \gg \underline{g}], p_0, c)$ ]

[existselim  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{x}. \forall \underline{f}. \forall \underline{g}. [\underline{x}] \#^0 [\underline{g}] \vdash \exists \underline{x}. (\underline{f}) \vdash \underline{f} \vdash \underline{g} \vdash \underline{g}$ ]

[existselim  $\xrightarrow{\text{pyk}}$  “existselim”]

## bottomelim

[bottomelim  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{f}. \forall \underline{g}. \underline{f} \wedge \neg \underline{f} \vdash \forall \underline{f}. \forall \underline{g}. \neg \underline{g} \vdash \text{andelim1} \triangleright \underline{f} \wedge \neg \underline{f} \gg \underline{f}; \text{pcdeduction} \triangleright \forall \underline{f}. \forall \underline{g}. \neg \underline{g} \vdash \underline{f} \gg \neg \underline{g} \vdash \underline{f}; \forall \underline{f}. \forall \underline{g}. \neg \underline{g} \vdash \text{andelim2} \triangleright \underline{f} \wedge \neg \underline{f} \gg \neg \underline{f}; \text{pcdeduction} \triangleright \forall \underline{f}. \forall \underline{g}. \neg \underline{g} \vdash \neg \underline{f} \gg \neg \underline{g} \vdash \neg \underline{f}; \text{notintro} \triangleright \neg \underline{g} \vdash \underline{f} \triangleright \neg \underline{g} \vdash \neg \underline{f} \gg \neg \neg \underline{g}; \text{notnotelim} \triangleright \neg \neg \underline{g} \gg \underline{g}], p_0, c)$ ]

[bottomelim  $\xrightarrow{\text{stmt}}$  pred calc  $\vdash \forall \underline{f}. \forall \underline{g}. \underline{f} \wedge \neg \underline{f} \vdash \underline{g}$ ]

[bottomelim  $\xrightarrow{\text{pyk}}$  “bottomelim”]

## lemnotintro

[lemnotintro  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{f}. \forall \underline{g}. \underline{f} \Rightarrow \underline{g} \wedge \neg \underline{g} \vdash \forall \underline{f}. \forall \underline{g}. \underline{f} \vdash \text{pcmp} \triangleright \underline{f} \triangleright \underline{f} \Rightarrow \underline{g} \wedge \neg \underline{g} \gg \underline{g} \wedge \neg \underline{g}; \text{andelim1} \triangleright \underline{g} \wedge \neg \underline{g} \gg \underline{g}; \text{pcdeduction} \triangleright \forall \underline{f}. \forall \underline{g}. \underline{f} \vdash$ ]

$\underline{g} \gg \underline{f} \vdash \underline{g}; \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \text{pcmp} \triangleright \underline{f} \triangleright \underline{f} \Rightarrow \underline{g} \wedge \neg \underline{g} \gg \underline{g} \wedge \neg \underline{g}; \text{andelim2} \triangleright \underline{g} \wedge \neg \underline{g} \gg \neg \underline{g}; \text{pcdeduction} \triangleright \forall \underline{f}: \forall \underline{g}: \underline{f} \vdash \neg \underline{g} \gg \underline{f} \vdash \neg \underline{g}; \text{notintro} \triangleright \underline{f} \vdash \underline{g} \triangleright \underline{f} \vdash \neg \underline{g} \gg \neg \underline{f}], p_0, c)$

$[\text{lemnotintro} \xrightarrow{\text{stmt}} \text{pred calc} \vdash \forall \underline{f}: \forall \underline{g}: \underline{f} \Rightarrow \underline{g} \wedge \neg \underline{g} \vdash \neg \underline{f}]$

$[\text{lemnotintro} \xrightarrow{\text{pyk}} \text{“lemnotintro”}]$

## nontriv0

$[\text{nontriv0} \xrightarrow{\text{proof}} \lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{p}: \forall \underline{q}: \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \vdash \underline{q} \Rightarrow \underline{p} \vdash \underline{p} \Rightarrow \underline{q} \vdash \text{pcmp} \triangleright \underline{p} \Rightarrow \underline{q} \triangleright \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \gg \underline{q}; \text{pcmp} \triangleright \underline{q} \triangleright \underline{q} \Rightarrow \underline{p} \gg \underline{p}], p_0, c)]$

$[\text{nontriv0} \xrightarrow{\text{stmt}} \text{pred calc} \vdash \forall \underline{p}: \forall \underline{q}: \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \vdash \underline{q} \Rightarrow \underline{p} \vdash \underline{p} \Rightarrow \underline{q} \vdash \underline{p}]$

$[\text{nontriv0} \xrightarrow{\text{pyk}} \text{“nontriv0”}]$

## nontriv1

$[\text{nontriv1} \xrightarrow{\text{proof}} \lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{p}: \forall \underline{q}: \underline{p} \vdash \neg \underline{p} \vdash \text{andintro} \triangleright \underline{p} \triangleright \neg \underline{p} \gg \underline{p} \wedge \neg \underline{p}; \text{bottomelim} \triangleright \underline{p} \wedge \neg \underline{p} \gg \underline{q}], p_0, c)]$

$[\text{nontriv1} \xrightarrow{\text{stmt}} \text{pred calc} \vdash \forall \underline{p}: \forall \underline{q}: \underline{p} \vdash \neg \underline{p} \vdash \underline{q}]$

$[\text{nontriv1} \xrightarrow{\text{pyk}} \text{“nontriv1”}]$

## nontriv2

$[\text{nontriv2} \xrightarrow{\text{proof}} \lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{p}: \forall \underline{q}: \neg \underline{p} \Rightarrow \underline{q} \vdash \neg \underline{p} \vdash \forall \underline{p}: \forall \underline{q}: \underline{p} \vdash \text{nontriv1} \triangleright \underline{p} \triangleright \neg \underline{p} \gg \underline{q}; \text{pcdeduction} \triangleright \forall \underline{p}: \forall \underline{q}: \underline{p} \vdash \underline{q} \gg \underline{p} \Rightarrow \underline{q}; \text{andintro} \triangleright \underline{p} \Rightarrow \underline{q} \triangleright \neg \underline{p} \Rightarrow \underline{q} \gg \underline{p} \Rightarrow \underline{q} \wedge \neg \underline{p} \Rightarrow \underline{q}], p_0, c)]$

$[\text{nontriv2} \xrightarrow{\text{stmt}} \text{pred calc} \vdash \forall \underline{p}: \forall \underline{q}: \neg \underline{p} \Rightarrow \underline{q} \vdash \neg \underline{p} \vdash \underline{p} \Rightarrow \underline{q} \wedge \neg \underline{p} \Rightarrow \underline{q}]$

$[\text{nontriv2} \xrightarrow{\text{pyk}} \text{“nontriv2”}]$

## nontriv3

$[\text{nontriv3} \xrightarrow{\text{proof}} \lambda c. \lambda x. \mathcal{P}([\text{pred calc} \vdash \forall \underline{p}: \forall \underline{q}: \neg \underline{p} \Rightarrow \underline{q} \vdash \forall \underline{p}: \forall \underline{q}: \neg \underline{p} \vdash \text{nontriv2} \triangleright \neg \underline{p} \Rightarrow \underline{q} \triangleright \neg \underline{p} \gg \underline{p} \Rightarrow \underline{q} \wedge \neg \underline{p} \Rightarrow \underline{q}; \text{pcdeduction} \triangleright \forall \underline{p}: \forall \underline{q}: \neg \underline{p} \vdash \underline{p} \Rightarrow \underline{q} \wedge \neg \underline{p} \Rightarrow \underline{q} \gg \neg \underline{p} \Rightarrow \underline{p} \Rightarrow \underline{q} \wedge \neg \underline{p} \Rightarrow \underline{q}; \text{lemnotintro} \triangleright \neg \underline{p} \Rightarrow \underline{p} \Rightarrow \underline{q} \wedge \neg \underline{p} \Rightarrow \underline{q} \gg \neg \neg \underline{p}; \text{notnotelim} \triangleright \neg \neg \underline{p} \gg \underline{p}], p_0, c)]$

$[\text{nontriv3} \xrightarrow{\text{stmt}} \text{pred calc} \vdash \forall \underline{p}: \forall \underline{q}: \neg \underline{p} \Rightarrow \underline{q} \vdash \underline{p}]$

[nontriv3  $\xrightarrow{\text{pyk}}$  “nontriv3”]

## nontriv4

[nontriv4  $\xrightarrow{\text{proof}}$   $\lambda c. \lambda x. \mathcal{P}([\text{pred calc } \vdash \forall \underline{p}: \forall \underline{q}: \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \vdash \underline{q} \Rightarrow \underline{p} \vdash \forall \underline{p}: \forall \underline{q}: \underline{p} \Rightarrow \underline{q} \vdash \text{nontriv0} \triangleright \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \triangleright \underline{q} \Rightarrow \underline{p} \triangleright \underline{p} \Rightarrow \underline{q} \gg \underline{p}; \text{pcdeduction} \triangleright \forall \underline{p}: \forall \underline{q}: \underline{p} \Rightarrow \underline{q} \vdash \underline{p} \gg \underline{q} \Rightarrow \underline{q} \vdash \underline{p}; \forall \underline{p}: \forall \underline{q}: \neg \underline{p} \Rightarrow \underline{q} \vdash \text{nontriv3} \triangleright \neg \underline{p} \Rightarrow \underline{q} \gg \underline{p}; \text{pcdeduction} \triangleright \forall \underline{p}: \forall \underline{q}: \neg \underline{p} \Rightarrow \underline{q} \vdash \underline{p} \gg \neg \underline{p} \Rightarrow \underline{q} \vdash \underline{p}; \text{orelim} \triangleright \underline{q} \Rightarrow \underline{q} \vdash \underline{p} \triangleright \neg \underline{p} \Rightarrow \underline{q} \vdash \underline{p} \gg \underline{p}], p_0, c)$ ]

[nontriv4  $\xrightarrow{\text{stmt}}$   $\text{pred calc } \vdash \forall \underline{p}: \forall \underline{q}: \underline{p} \Rightarrow \underline{q} \Rightarrow \underline{q} \vdash \underline{q} \Rightarrow \underline{p} \vdash \underline{p}$ ]

[nontriv4  $\xrightarrow{\text{pyk}}$  “nontriv4”]

## nontriv5

[nontriv5  $\xrightarrow{\text{pyk}}$  “nontriv5”]

## nontriv6

[nontriv6  $\xrightarrow{\text{pyk}}$  “nontriv6”]

\*  $\equiv$  \*

[y  $\equiv$  b  $\xrightarrow{\text{tex}}$  “#1. \equiv #2.”]

[\*  $\equiv$  \*  $\xrightarrow{\text{pyk}}$  “” setequiv ””]

\* = \*

[y = b  $\xrightarrow{\text{tex}}$  “#1. = #2.”]

[\* = \*  $\xrightarrow{\text{pyk}}$  “” setequals ””]

$\neg$ \*

[ $\neg$ x  $\xrightarrow{\text{tex}}$  “\neg #1.”]

[ $\neg$ \*  $\xrightarrow{\text{pyk}}$  “\not ””]

\*  $\wedge$  \*

[x  $\wedge$  y  $\xrightarrow{\text{tex}}$  “#1. \wedge #2.”]

[\*  $\wedge$  \*  $\xrightarrow{\text{pyk}}$  “ ” land “ ”]

\*  $\vee$  \*

[x  $\vee$  y  $\xrightarrow{\text{tex}}$  “#1. \vee #2.”]

[\*  $\vee$  \*  $\xrightarrow{\text{pyk}}$  “ ” lor “ ”]

$\forall$  \* . ( \* )

[ $\forall$ y. (b)  $\xrightarrow{\text{tex}}$  “\forall #1. . \left(#2.\right)”]

[ $\forall$ \* . ( \* )  $\xrightarrow{\text{pyk}}$  “forall ” dot “ ” end forall”]

$\exists$  \* . ( \* )

[ $\exists$ y. (b)  $\xrightarrow{\text{tex}}$  “\exists #1. . \left(#2.\right)”]

[ $\exists$ \* . ( \* )  $\xrightarrow{\text{pyk}}$  “exists ” dot “ ” end exists”]

\*  $\in$  \*

[y  $\in$  b  $\xrightarrow{\text{tex}}$  “#1. \in #2.”]

[\*  $\in$  \*  $\xrightarrow{\text{pyk}}$  “ ” setin “ ”]

*The pyk compiler, version 0.grue.20060417+ by Klaus Grue*

*GRD-2006-07-12.UTC:19:00:11.024866 = MJD-53928.TAI:19:00:44.024866 =*

*LGT-4659447644024866e-6*